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EXAMINER

ROSENBERGER, FREDERICK F

ART UNIT PAPER NUMBER

2878

DATE MAILED: 05/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/731,178

Applicant(s)

FOWLER ET AL.

Examiner

Frederick F. Rosenberger

Art Unit

2878

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 11-23 is/are rejected.
- 7) ☒ Claim(s) 9, 10 and 24-27 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/9/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to because reference character **34** in Figure 4 should indicate the C_G value at an angle of 180 degrees, as specified in paragraph 32, line 10 of the disclosure. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: **23** (Figure 9). Corrected drawing sheets in compliance with 37 CFR

1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: **73** (on page 13, line 4). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The specification is objected to under 37 CFR 1.42(a)(1)(ii) for having improper margins. Application papers are required to be filed on 8.5-by-11 inch paper with each sheet including a top margin of at least $\frac{3}{4}$ inch, a left side margin of at least 1 inch, a right side margin of at least $\frac{3}{4}$ inch, and a bottom margin of at least $\frac{3}{4}$ inch. New application papers with proper margins on good quality paper are required.

5. The disclosure is objected to because of the following informalities: On page 5, line 1 of paragraph 22, "suficiently" should be "sufficiently". Appropriate correction is required.

Claim Objections

6. Claim 25 is objected to because of the following informalities: In claim 25, item (c), "rotation" should be "rotating". Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Byrd (US Patent # 5,345,084).

Byrd disclose an apparatus and method capable of being used as a survey instrument comprising:

A moderator, in the form of polyethylene wedges **32, 34, 36, and 38** in Figure 2 (column 3, lines 63-68);

An array of four gamma ray detectors **22, 24, 26, and 28** within the moderator elements, as shown in Figure 2;

Wherein the responses of the gamma ray detectors to a source of radiation are combined to yield an indication of position of the source relative to a reference through processor **22** in Figure 1 and indicator **24** in Figure 1 (column 3, lines 28-32).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 2, 3, 6, 7, 12, 14, 15, 17, 18, 21, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrd, as applied to claims 1 and 16 above, and further in view of Fehlau (Journal paper entitled "Integrated Neutron/Gamma-ray Portal Monitors for Nuclear Safeguards").

Byrd discloses all the limitations of the parent claims 1 and 16, as discussed above. However, Byrd is silent with regards to the inclusion of a neutron detector wherein the moderator has been optimized to allow responsiveness to fast and thermal neutrons.

Fehlau teaches that a neutron-chamber detector with a single thermal neutron proportional counter in combination with plastic scintillators, thus allowing for detection of neutrons from large quantities of radioactive material or gamma rays from small quantities of gamma ray material (see abstract). Fehlau further teaches that even though neutron proportional counters, such as the ^3He counter, are primarily slow neutron (i.e. thermal neutron) responsive, they can be made to detect neutrons over a broad energy range by surrounding with a moderator that can slow down fast neutrons and admit thermal neutrons for detection (page 922, bottom of column 2).

Thus, it would have been obvious for a person having ordinary skill in the art to modify the detector of Byrd to include a neutron counter to allow for the detection of a wide range of radioactive material, as taught by Fehlau. It would have been further obvious to a person having ordinary skill in the art at the time of the invention to provide a moderator thickness around the neutron counter of sufficient thickness to allow passage of thermal neutrons and moderation of fast neutrons to allow detection of neutrons over a broad energy range, as taught by Fehlau.

With regards to the limitations of claims 3 and 18, Byrd discloses a processor **22** (Figure 1) for determining gamma ray intensity and source location as well as an indicator **24** (Figure 1) for indicating the direction of the source (column 3, lines 20-32).

With regards to the limitations of claims 6 and 21, Byrd discloses an indicator 24 (Figure 1) for displaying the direction of the source. However, Byrd does not address if other quantities, such as neutron response or gamma intensity, should be displayed. Yet, it is well known in the art that radioactive signal strength would provide a measure of the size of the source as well as a measure of the relative distance between the source and the detector. It would have been obvious to a person having ordinary skill in the art to include this information in the display of the detector disclosed by Byrd, so as to provide the operator with additional information regarding the nature and distance of the source.

With regards to claims 7 and 22, applicant proposes the additional limitations of the moderator being rectangular, the gamma ray detectors being an array of four, the gamma ray detectors being scintillators with light collectors, and the gamma ray detectors being disposed around the neutron counter at the corners of the moderator. Byrd discloses the array of four gamma ray detectors being scintillators with photomultiplier tubes as light detectors (column 3, lines 1-4). However, Byrd is silent with regards to the moderator being rectangular. It would have been an obvious matter of design choice to make the moderator rectangular since applicant has not disclosed that the shape of the moderator solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the shape of the moderator being different from rectangular. Byrd is also silent with regards to the gamma ray detectors surrounding the neutron counter. The combination of Byrd and Fehlau only provide for the inclusion of the neutron counter with the survey instrument,

Art Unit: 2878

not the location of the counter. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to place the neutron counter in the center of the gamma radiation detector array since it has been held that rearranging parts of an invention involves only routine skill in the art. In re Japikse, 86 USPQ 70.

With regards to claim 12, the ^3He neutron counters are well known in the art. For example, Fehlau discloses that the neutron detector is a ^3He proportional counter. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a ^3He counter for the neutron detector since it was known in the art that the ^3He counter has sufficient sensitivity for the detection of neutrons from radioactive materials.

With regards to claim 15, Byrd does not specifically disclose that the system can be handheld. It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the device handheld, since it has been held that making an old device portable or movable without producing any new and unexpected result involves only routine skill in the art. In re Lindberg, 194 F.2d 732, 93 USPQ 23 (CCPA 1952).

11. Claims 4 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrd and Fehlau, as applied to claims 3 and 18 above, and further in view of Kronenberg (US Patent # 4,893,017).

The combination of Byrd and Fehlau disclose all of the limitations of the parent claims 3 and 18, as discussed above. However, Byrd and Fehlau are silent with

Art Unit: 2878

regards to the intensity of incident gamma rays being the sum of the responses from the gamma ray detectors.

Kronenberg teaches a pocket radiac device using an array of gamma ray detectors wherein the total gamma ray dose is determined from the combination of signals from the array of gamma detectors; thus allowing for increased sensitivity over the use of just one detector to determine incident gamma radiation (column 3, lines 9-11).

Thus, it would have been obvious for a person having ordinary skill in the art to modify the combination of Byrd and Fehlau to use the sum of the gamma ray detector responses as a measure of the intensity of gamma radiation to allow for increased sensitivity over a single detector, as taught by Kronenberg.

12. Claims 5 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrd and Fehlau, as applied to claims 3 and 18 above, and further in view of Rubin (US Patent # 4,172,226).

The combination of Byrd and Fehlau discloses all of the limitations of the parent claims 3 and 18, as discussed above. However, the combination of Byrd and Fehlau is silent with regards to the direction of the gamma radiation being determined based on the ratio of responses of pairs of gamma ray detectors. Instead, Byrd employs a difference measurement to determine the relative position of the source between pairs of detectors.

Rubin discloses a system for remote radiation detection using an array of gamma detectors. Specifically, Rubin teaches that the location of a source can be determined using ratios of the signals from four fixed position omnidirectional radiation detectors (column 2, lines 13-22). Rubin teach that by using such an arrangement, the location of the radiation sources can be determined in three dimensions.

Thus, it would have been obvious for a person having ordinary skill in the art to modify the combination of Byrd and Fehlau to determine use the ratio of responses of pairs of gamma ray detectors so as to be able to determine the location of the source in three dimensions, as taught by Rubin.

13. Claims 8, 11, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Byrd and Fehlau, as applied to claims 7 and 22 above, and further in view of Kronenberg (US Patent # 4,893,017) and Rubin (US Patent # 4,172,226).

Byrd and Fehlau address all the limitations of the parent claims 7 and 22, as discussed above. However, the combination of Byrd and Fehlau is silent with regards to the direction of the gamma radiation being determined based on the ratio of responses of pairs of gamma ray detectors. Instead, Byrd employs a difference measurement to determine the relative position of the source between pairs of detectors.

Rubin discloses a system for remote radiation detection using an array of gamma detectors. Specifically, Rubin teaches that the location of a source can be determined using ratios of the signals from four fixed position omnidirectional radiation detectors

Art Unit: 2878

(column 2, lines 13-22). Rubin teach that by using such an arrangement, the location of the radiation sources can be determined in three dimensions.

Thus, it would have been obvious for a person having ordinary skill in the art to modify the combination of Byrd and Fehlau to determine use the ratio of responses of pairs of gamma ray detectors so as to be able to determine the location of the source in three dimensions, as taught by Rubin.

Further, Byrd and Fehlau are silent with regards to the intensity of incident gamma rays being the sum of the responses from the gamma ray detectors.

Kronenberg teaches a pocket radiac device using an array of gamma ray detectors wherein the total gamma ray dose is determined from the combination of signals from the array of gamma detectors; thus allowing for increased sensitivity over the use of just one detector to determine incident gamma radiation (column 3, lines 9-11).

Thus, it would have been obvious for a person having ordinary skill in the art to modify the combination of Byrd and Fehlau to use the sum of the gamma ray detector responses as a measure of the intensity of gamma radiation to allow for increased sensitivity over a single detector, as taught by Kronenberg.

With regards to claim 11, Byrd discloses an indicator **24** (Figure 1) for displaying the direction of the source. However, Byrd does not address if other quantities, such as neutron response or gamma intensity, should be displayed. Yet, it is well known in the art that radioactive signal strength would provide a measure of the size of the source as well as a measure of the relative distance between the source and the detector. It

Art Unit: 2878

would have been obvious to a person having ordinary skill in the art to include this information in the display of the detector disclosed by Byrd, so as to provide the operator with additional information regarding the nature and distance of the source.

14. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Byrd and Fehlau, as applied to claim 7 above, and further in view of Drukier et al. (US Patent # 5,866,907).

The combination of Byrd and Fehlau disclose all of the limitations of the parent claim 7, as discussed above. However, the combination of Byrd and Fehlau is silent with regards to the scintillator being a CsI scintillator and the light collector being a photodiode. Instead, Byrd uses a borated plastic scintillator rod for the scintillator and a photomultiplier tube for the light collector.

However, it is well known that CsI is often used a scintillator in gamma radiation applications in combination with a photodiode or photomultiplier tube. For example, Drukier et al. teach the use of CsI doped with (TI) as a scintillator since, among the various scintillators, produces the best light yield (column 2, lines 20-23). Drukier et al. also teach that a photodiode, specifically an avalanche photodiode, can be used in place of a photomultiplier tube in scintillation applications as it provides a lower energy consumption and smaller packaged photoelectric conversion device which is also less sensitive to environmental disturbances (column 15, lines 3-13).

Thus, it would have been obvious for a person having ordinary skill in the art to modify the combination of Byrd and Fehlau to use CsI for the scintillator material so as

Art Unit: 2878

to provide better light yield, as taught by Drukier et al. It would have been further obvious to modify the combination of Byrd and Fehlau to use a photodiode instead of photomultiplier tubes for the light collecting device to take advantage of the photodiode's robustness and energy savings, as taught by Drukier et al.

Allowable Subject Matter

15. Claims 9, 10, and 24-27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

16. The following is a statement of reasons for the indication of allowable subject matter:

Claims 9 and 24, when incorporating the limitations of the parent claims, are directed to an apparatus and method for a survey instrument comprising a rectangular moderator, a neutron detector wherein the dimensions of the moderator, material of the moderator, and location of the neutron detector within the moderator chosen to allow the neutron detector to be equally responsive to fast and thermal neutrons, an array of four gamma ray detectors disposed within the moderator with major axes of the gamma ray detectors parallel to the major axes of the neutron detector, wherein each gamma ray detector comprising a scintillator and a light collecting device optically coupled to the scintillator, and a processor for combining the gamma ray detector responses to yield an intensity of impinging gamma radiation and an indication of azimuthal direction of the

Art Unit: 2878

source, wherein said direction is determined by a ratio of responses of pairs of the gamma ray detectors and the sum of response of the gamma ray detectors. The prior art does not disclose or suggest such a survey instrument wherein the direction of the source is determined via the responses of the parallel oriented gamma ray detectors based on the combination of ratio and sum data from gamma radiation detector responses. Instead, the prior art has focused on a differential method (see Byrd) or a ratio-based methods (see Rubin) for determining source direction. As such, applicant's disclosure provides a novel and nonobvious improvement over the prior art.

Accordingly, the present claims 9 and 24 would be allowable. Claim 25 would be allowable by virtue of its dependence on claim 24.

Claims 10 and 26, when incorporating the limitations of the parent claims, are directed to an apparatus and method for a survey instrument comprising a rectangular moderator, a neutron detector wherein the dimensions of the moderator, material of the moderator, and location of the neutron detector within the moderator chosen to allow the neutron detector to be equally responsive to fast and thermal neutrons, an array of four gamma ray detectors disposed within the moderator with major axes of the gamma ray detectors perpendicular to the major axes of the neutron detector, wherein each gamma ray detector comprising a scintillator and a light collecting device optically coupled to the scintillator, and a processor for combining the gamma ray detector responses to yield an intensity of impinging gamma radiation and an indication of azimuthal direction of the source, wherein said direction is determined by a ratio of responses of pairs of the gamma ray detectors. The prior art does not disclose or

Art Unit: 2878

suggest such a survey instrument wherein the direction of the source is determined via the responses of the perpendicularly oriented gamma ray detectors based on the ratio data from the gamma radiation detectors. Instead, the prior art only addresses parallel oriented gamma ray detectors with respect to the neutron detector (see Fehlau). As such, applicant's disclosure provides a novel and nonobvious improvement over the prior art. Accordingly, the present claims 10 and 26 would be allowable. Claim 27 would be allowable by virtue of its dependence on claim 26.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

G. Brown (US Patent # 5,274,238) disclose an apparatus and method for locating a source of ionizing radiation using a ratio between a reference gamma ray sensor and a second gamma ray sensor surrounded by a variable thickness filter.

L. Brown (US Patent # 3,581,090) disclose a radially disposed array of gamma detectors integrated with a single photomultiplier tube, which uses the sum of the responses of the gamma ray detectors to determine position of a radiation source.


18. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Frederick F. Rosenberger whose telephone number is 571-272-6107. The examiner can normally be reached on Monday-Friday 7:30 AM - 4:30 PM.

Art Unit: 2878

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Frederick F. Rosenberger
Patent Examiner
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